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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/217,213	12/21/1998	MARK I. GARDNER	5500-05001	8618
7590 09/21/2004				
KEVIN L DAFFER CONLEY ROSE & TAYSON P O BOX 3267 HOUSTON, TX 772533267			EXAMINER MAI, ANH D	
			ART UNIT 2814	PAPER NUMBER

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/217,213	Applicant(s) GARDNER ET AL.	
	Examiner Anh D. Mai	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 1998.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 1998 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/21/98</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

1. the Preliminary Amendment filed December 21, 1998 has been entered. Claims 1-17 have been canceled. Claim 18 has been amended. Claims 19-26 have been added. Thus, Claims 18-26 are pending.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: TRENCH ISOLATION STRUCTURE HAVING SILICON ATOMS OR BARRIER ATOMS EMBEDDED AT THE CORNER.

Claim Objections

3. Claim 26 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 26 recites: wherein the barrier atoms are arranged within a source or drain region of the semiconductor substrate within 0.1 μm of the trench. (As shown in Fig. 15).

However, claim 22, the independent claim, recites: barrier atoms arranged within the semiconductor substrate beneath a spacer. (As shown in Fig. 12a).

Clearly, claim 26 claimed a different device. Thus fails to further limit claim 22.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Mehta (U.S. Patent No. 5,679,599).

Mehta teaches an isolation structure laterally disposed between a first active region and a second active region of a semiconductor substrate as claimed including:

a trench (200) formed within semiconductor substrate (100);

a thermally grown oxide layer (220) having a first portion disposed across a bottom of trench (200) and second and third portions (sidewalls) disposed within trench (200) laterally adjacent to the first and second active regions;

a deposited oxide (230c) disposed within trench (200) above the first portion and between the second and third portions (sidewalls), the deposited oxide (230c) having an upper surface which is approximately coplanar with the upper surface of semiconductor substrate (100); and

silicon atoms arranged within regions of the first and second active regions proximate the upper surface of the substrate (100) and laterally adjacent to the second and third portions of the thermally grown oxide (220). (See Fig. 17).

Since the semiconductor substrate (100) of Mehta is a silicon substrate, thus, the limitation of “silicon atoms arranged within regions of the first and second active regions” is met.

With respect to claim 19, the silicon atoms of Mehta are arranged within the first and second active regions directly beneath a spacer (180).

With respect to claim 20, the spacer (180) of Mehta extends from a sidewall of a masking layer (120) residing over the semiconductor substrate (100) to the lateral perimeter of the trench (200).

5. Claims 22-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Jang (U.S. Patent No. 5,399,520).

With respect to claim 22, Jang teaches a semiconductor topography as claimed including: a dielectric filled trench (17) arranged within a semiconductor substrate (11); and

barrier atoms arranged within the semiconductor substrate (11) beneath a spacer (16) that extends above a portion of the semiconductor substrate (11) between the trench (17) and a sidewall surface of a masking layer (14). (See Fig. 2H).

Since the liner 19 is formed by nitridation, thus barrier atoms (nitrogen) is arranged within the semiconductor substrate beneath the spacer. Therefore, the limitation of the claim is met.

With respect to claim 23, the spacer (16) of Jang is configured laterally between a peripheral of the trench (17) and the sidewall surface of the masking layer (14).

With respect to claim 24, the spacer (16) of Jang is made of a different material (16) than the dielectric (20) filled trench.

With respect to claim 25, the barrier atoms of Jang are selected from the group consisting of nitrogen.

With respect to claim 26, as best understood by the examiner, Jang teaches the barrier atoms (nitrogen) are arranged within 0.1 μm from the trench, e.g., the thickness of layer (19). The regions approximate the sidewalls of the trench are well known to be source or drain region of the transistor. (See Saito, U.S. Patent No. 5,561,072, IDS).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 21 rejected under 35 U.S.C. 103(a) as being unpatentable over Mehta '599 as applied to claim 20 above, and further in view of Lee et al. (U.S. Patent No. 5,753,561).

Mehta teaches an isolation structure as described in claim 20 above including: the lateral distance between the sidewall of the masking layer (120) and the trench (200), over which the spacer extends, is equal to the thickness of the spacer (180).

Thus, Mehta is shown to teach all the features of the claim with the exception of disclosing a thickness of 0.1 μm .

However, Kawamura teaches a spacer (7a) is formed to a thickness of 0.05 to 0.1 μm . (See Fig. 1f).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the spacer of Mehta to the thickness as taught by Kawamura to control the opening of the trench beyond the limit of the photolithography. This is well known in the art.

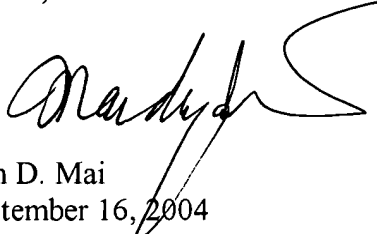
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Anh D. Mai
September 16, 2004